

New-York and *Britain*, which on the Northern Part may be made so wide as to take in the *Newfoundland* Trade, &c. But I shall mention no more Particulars; for in the same Manner it will be easy to construct *Tables* to all those considerable Parts of the World, to which Voyages are perform'd.

V. *Some Observations towards composing a Natural History of Mines and Metals, communicated in a Letter to Dr. Rutty, S. R. Secr. & Coll. Med. Lond. Soc. By Dr. Frank Nicholls, Professor of Anatomy at Oxford.*

Dear Sir,

IN Obedience to your Commands, I here send you the Particulars of what I observ'd during a Year's Stay in the Western Part of *Cornwall*, concerning *Mines*, &c.

Mines in general are Veins or Cavities within the Earth, whose Sides receding from, or approaching nearer to each other, make them of unequal Breadths in different Places; sometimes forming large Spaces, which are call'd Holes. They are fill'd with Substances, which, whether metallick, or of any other Nature, are term'd the *Loads*. When the Substances forming these Loads are reducible to Metal, the Loads are by the Miners said to be *alive*; otherwise they are term'd *dead Loads*.

In

In *Cornwall* and *Devon* the Loads always hold their Course from Eastward to Westward ; tho' in other Parts of *England* they frequently run from North to South. The Miners report, that the Sides of the Load never bear in a Perpendicular, but constantly underlay either to the North or South.

The Mines seem to be, or to have been, the Channels thro' which the Waters pass within the Earth ; and, like Rivers, have their small Branches opening into them in all Directions ; which are by the Miners term'd, the *Feeders* of the Load.

Most Mines have Streams of Water running thro' them, and when they are found dry, it seems to be owing to the Waters having changed their Course, as compell'd to it, either because the Load had stopp'd up the antient Passages, or that some new and more easy ones are made.

The Load is frequently intercepted by the crossing of a Vein of Earth, or Stone, or some different metallick Substance. In which Case it generally happens, that one Part of the Load is moved a considerable Distance to one Side. This transient Load is by the Miners term'd a *Flooding* ; and the Part of the Load which is moved, is, in their Terms, said to be *heaved*. This heaving the Load would be an inexpressible Loss to the Miner, did not Experience teach him, that, as the Loads always run on the Sides of the Hills, so the Part heaved is always moved towards the Descent of the Hill. So that the Miner working towards the Ascent of the Hill, and meeting a *Flooding*, considers himself as working in the Part heaved ; wherefore cutting thro' the *Flooding*, he works upon its Back towards the Ascent of the Hill, till he recovers the Load, and *vice versâ*.

Thus in *Figure* the *first*, AD shews a Load running in the Side of a Hill, B the *Feeders*, C the *Flook-ing*, D is the Part *heaved*.

Sometimes, tho' not constantly, the Mine is lined with an intermediate Substance between the Load and it self. This is (properly speaking) the Wall of the Load: Though, in the common Acceptation of that Term, it signifies either such intermediate Substance, or the Side of the Mine, where the Load immediately unites it self to it. Thus in *Figure* the *second*, A is the Side of the Mine, B the intermediate Wall of white Mundick, C the Load of Copper. And in *Figure* the *third*, AB the two Walls of *Spar-Stone*, C a small Vein of *Tin Oar*.

The Springs in these Parts are always hard, as abounding very much, either in stony, or *sulphureo-saline* Particles.

From this Water thus saturated with stony Particles, we frequently find the Passages of the Water under Ground, either partly, or totally stopp'd up; the stony Matter gradually concreting round the Sides of the Mine, and forming thereby a confused Load of Spar-Stone.

At other Times this stony Matter concretes more distinctly: In which Case the stony Matter seems to be govern'd in its Concretion by a *Plastick* Power.

N.B. When I speak of a *Plastick* Power, I would be understood as meaning only a *Modus* of *Attraction*, by which the attracted Particles are rang'd in this or that determin'd Form. This Power then so exerts its Action, as to range the concreting Matter into the Form of an *hexagonal Prism*, whose Head goes off in an
2
hexagonal

hexagonal Pyramid. Where this plastick Power happens to be single and uncontroul'd, it preserves the Form of the Cristal to very considerable Magnitudes.

In these single Cristals we may observe, that they are of different Transparencies and Colours, as the stony Matter is more or less disengaged from other Substances, or as those other Substances are capable of imparting different Tinctures to them. And that they seem form'd *laminatim*; tho' the *Laminæ* are only distinguishable, when the Matters from whence the Cristal is successively form'd, happens to differ in Purity. Thus in *Figure* the *fourth*, the Cristal was at first form'd from Matter intangled with a foul yellow Substance; after which, a pure Matter advening, the Cristal was in its future Lamination form'd more pure and transparent.

But where the plastick Particles are more numerous, there seems Reason to believe, that these very *Plastick Particles*, before they are fix'd, are subject to the Controul and Direction of any fix'd *plastick Particle*, within the Verge of whose Activity they happen to move: notwithstanding which, after they are once fix'd, they exert their own *plastick Powers*, and, in Conjunction with the first *plastick Particle*, govern the future Concretion, in such Manner as to form a seemingly irregular Cristal, tho' composed of two or more regular Cristals. Thus in *Figure* the *fifth* and *sixth* A and C seem to have attracted amongst the stony Particles, two plastick Particles, which afterwards exerting their own Powers, form the additional Cristals B and D.

There are many Phænomena observable in these Cristals, which, at present, I may pass over, as less relating

lating to the Affair of *Metals* ; wherefore I shall only add, that these cristalline Concretions exert a strong Attraction on many metallick Substances. As in *Fig. 7.* A the Spar has attracted the three Portions of Lead B. and in *Fig. 8.* the Cristals C have attracted the Copper D, and are attracted by the Lead E.

The *sulphureo-saline* Particles, with which, as I observed, the Waters are frequently saturated, are found to be either of a vitriolick or an arsenical Nature : The first constantly, if pure, concreting into white *Cubes* resembling Grains of Silver, while the arsenical Sulphur concretes into yellow Cubes like Grains of pure Gold. Both these are by the Miners term'd *Mundick*.

These *sulphureo-saline* Substances seem directed in their Concretions by a plastick Particle, in the same Manner as the Cristals above-mention'd ; and, like them, upon the same Principles, are found simple or compound. In their Sides you may observe the Concretion forms it self like Threads, which in three Sides run in different Directions, but are always similar in the opposite Sides.

Fig. 9. shews one of these Cubes, A the parallel Threads.

Fig. 10. shews another of these Cubes, from whose Sides arise small Segments of Cubes C.

But this *plastick Power* seems to be weaken'd or destroy'd, in Proportion, as this sulphureous Matter is more or less intangled with metallick Substances.

Thus in *Fig. 11.* the plastick Particle seems for a while to have exerted its Power in the usual Manner, till the advening Matter grew intangled with a small Quantity of Copper, after which it seems only to have exerted its *attractive* but not its *plastick Power*.
And

And in *Fig. 12.* the white *Mundick* being infected with Iron, seems so far from being affected by a *plastic Power*, that it concreted in the Form of Icicles from the Fluid which transfused thro' the Top of the Mine.

Fig. 13. represents some small Cubes of white or vi-triolic *Mundick*.

But to return to the Mines: They are found to contain Tin, Lead, Copper, Iron, and a pseudometallick Substance, by the Miners term'd *Glist*: For the Particulars of all which, as they would vastly swell the Bulk of one Letter, I must refer you to my next.

I am,

With the utmost Respect,

Your obliged Friend,

Fran. Nicholls.

Plate 2.
Fig. 12.

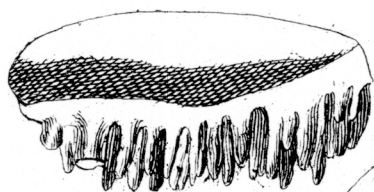


Fig. 9.

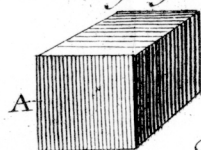


Fig. 10.



Fig. 7.

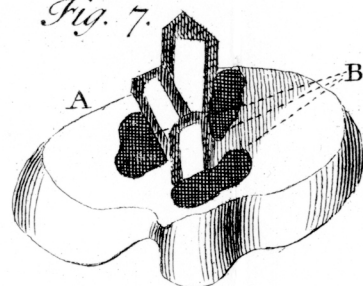


Fig. 13.

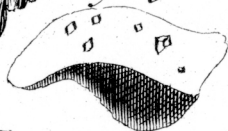


Fig. 11.



Fig. 1.

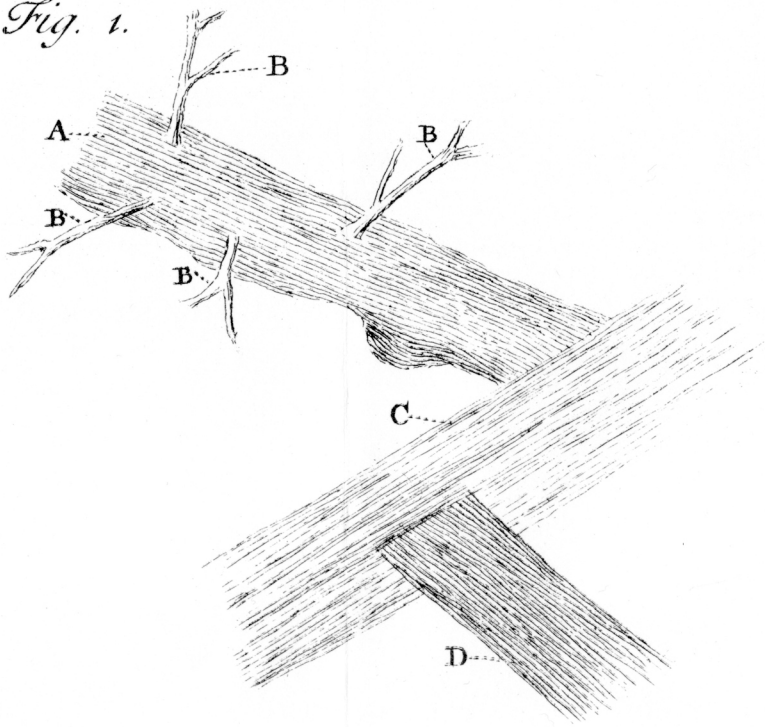


Fig. 2.

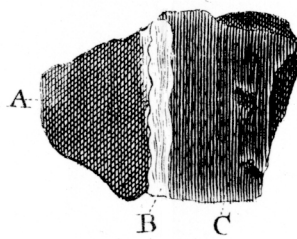


Fig. 7.

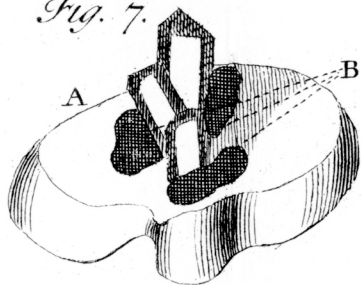
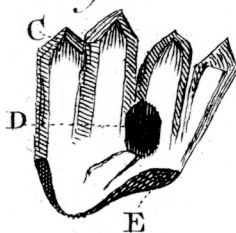


Fig. 8.



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Fig. 5.

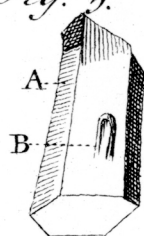


Fig. 6.

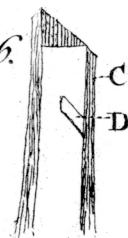


Fig. 4.

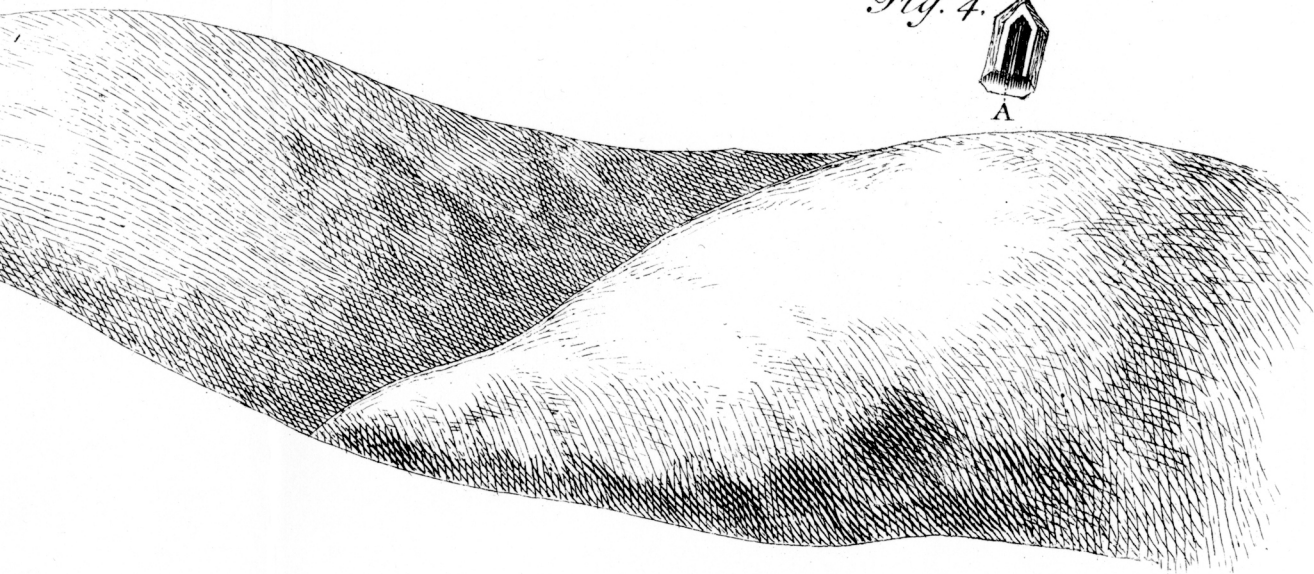


Fig. 2.

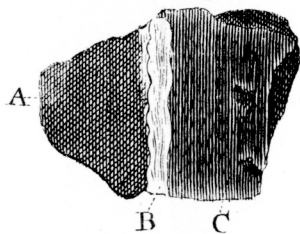


Fig. 3.

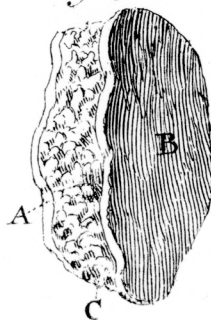


Plate 2
Fig. 12.



Fig. 9.

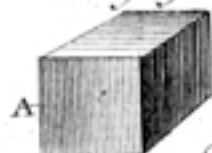


Fig. 10.



Fig. 11.



Fig. 13.



Fig. 7.

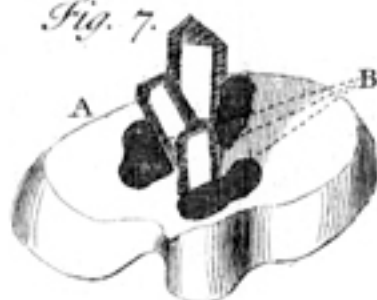


Fig. 8.



Phile. Trans. N. 401.
Fig. 5.



Fig. 6.

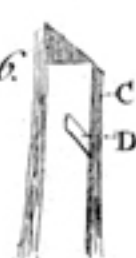


Fig. 4.



Fig. 1.

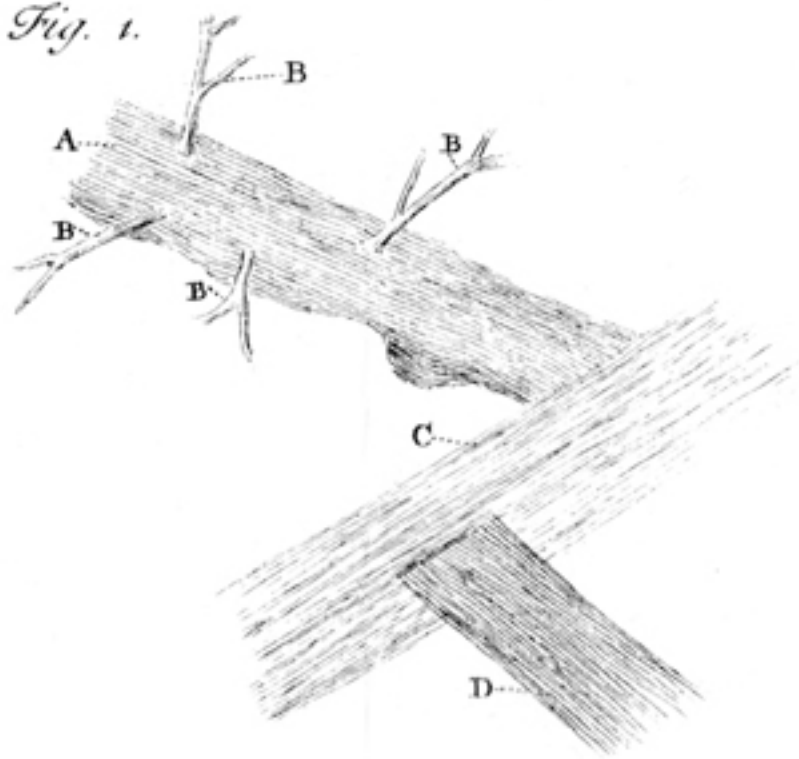


Fig. 2.

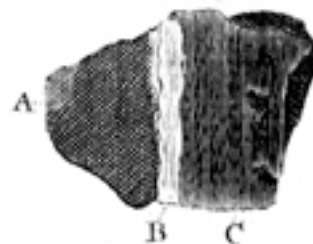


Fig. 3.

